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**UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER
MAIN EXAMINATIONS**

FOR THE DEGREE OF BSC (CHEMISTRY)

COURSE CODE: SCH 314

COURSE TITLE: CHEMISTRY OF AROMATIC COMPOUNDS

DURATION: 2 HOURS

DATE: 6/12/2023

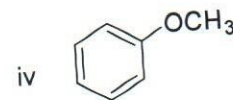
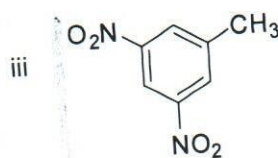
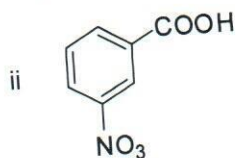
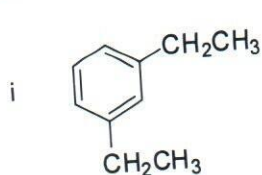
TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

Question 1 (30 marks)

- a) State Huckel's rule. (1 mark)
- b) Describe resonance theory and how it applies to stability of benzene (4 marks)
- c) State the application of benzene in daily life (4 marks)
- d) Based on your understanding of the basic principles of molecular orbitals, draw the lowest energy (π_1) and highest energy (π_6) MO's. Indicate the bonding and antibonding MO's and the number of nodes in each case. (5 marks)
- e) Draw the structures of the following (4 marks)
- i) Aniline ii) Phenol iii) Benzoic acid iv) Toluene
- f) Name the following compounds



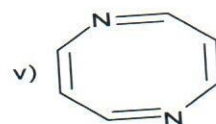
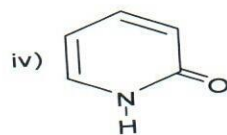
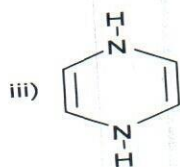
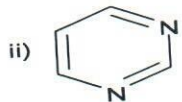
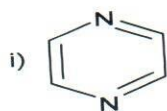
g) State the polygon MO rule (1 mark)

h) Define the terms below and for each give two examples (2 marks)

i. Ring activators (2 marks)

ii. Ring deactivators (3 marks)

i) Which of the following compounds are aromatic?



Question 2 (20 marks)

a) Draw energy level diagram showing polygons of benzene, cyclobutadiene and cyclooctatetraene. State whether it is an open or closed system. (6 marks)

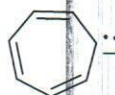
b) Stating reasons which compounds are aromatic, antiaromatic and nonaromatic. (10 marks)



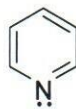
i



ii



iii



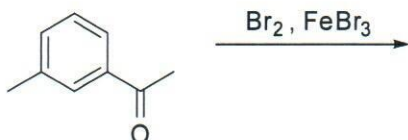
iv



v

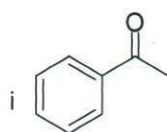
c) Draw the major product

(1 mark)

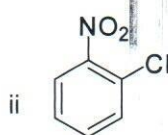


d) Which of the following is compatible with a Friedel-Crafts reaction. Explain

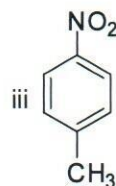
(3 marks)



i



ii



iii

Question 3 (20 marks)

Using molecular orbital theory to explain stability of benzene

(20 marks)

Question 4 (20 marks)

a) State for uses of naphthalene

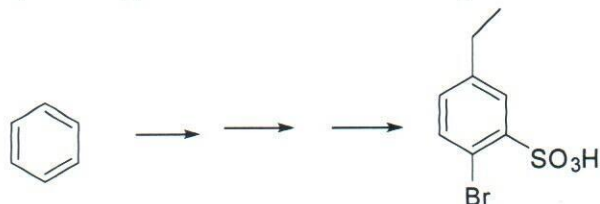
(4 marks)

b) Name the reaction and draw the products from the reaction of naphthalene in presence of these conditions/ reagents;

(6 marks)

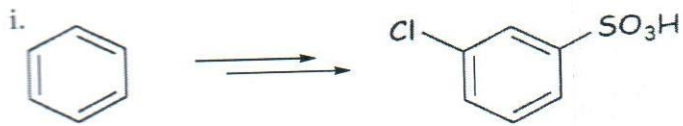
- $\text{HNO}_3, \text{CH}_3\text{COOH}, 50-70^\circ\text{C}$
- $\text{Br}_2, \text{CCl}_4, \text{heat}$
- $\text{H}_2/\text{Ni}, \text{pressure}$

c) Starting with benzene show the synthetic route followed to produce the product. (10 marks)

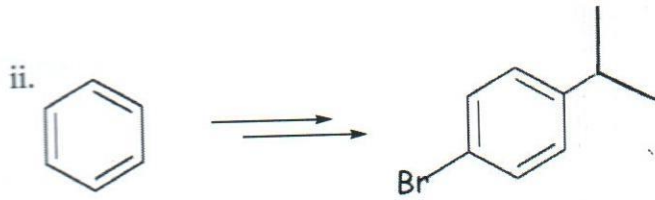


QUESTION 5 (20 MARKS)

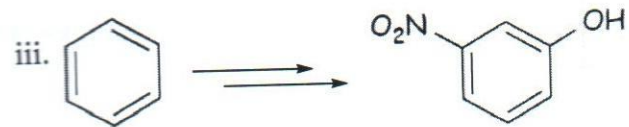
a) Give the synthetic route that leads to the products given below. Ensure you draw a product every step.



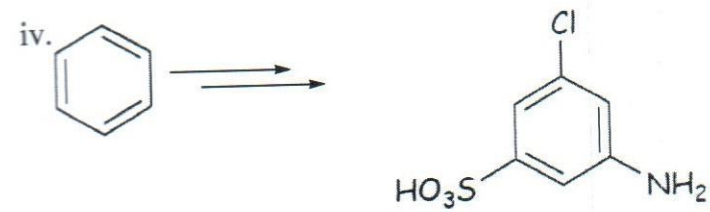
(3 marks)



(3 marks)



(7 marks)



(7 marks)